Full wwPDB X-ray Structure Validation Report ⓘ

Jun 29, 2025 – 08:09 am BST

PDB ID	:	9FI1 / pdb_00009fi1
Title	:	Bacteroides ovatus polysaccharide lyase family 38 (BoPL38) mutant H297N at pH 3.5
Authors	:	Tandrup, T.; Wilkens, C.
Deposited on	:	2024-05-28
Resolution	:	2.36 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

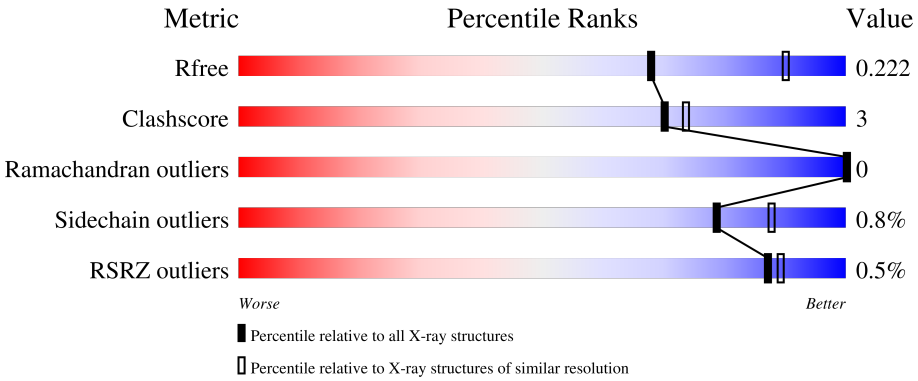
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.36 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1460 (2.36-2.36)
Clashscore	180529	1571 (2.36-2.36)
Ramachandran outliers	177936	1559 (2.36-2.36)
Sidechain outliers	177891	1559 (2.36-2.36)
RSRZ outliers	164620	1460 (2.36-2.36)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	404	86% 9% 6%
1	B	404	88% 6% 6%
1	C	404	88% 6% 6%
1	D	404	.% 83% 11% 6%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 12939 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Alginate lyase family protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	381	Total	C	N	O	S	0	3	0
			3075	1969	518	575	13			
1	B	381	Total	C	N	O	S	0	4	0
			3079	1970	519	577	13			
1	C	381	Total	C	N	O	S	0	7	0
			3099	1985	524	577	13			
1	D	380	Total	C	N	O	S	0	2	0
			3064	1960	517	574	13			

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP A0A5M5BWR5
A	2	GLY	-	expression tag	UNP A0A5M5BWR5
A	3	SER	-	expression tag	UNP A0A5M5BWR5
A	4	SER	-	expression tag	UNP A0A5M5BWR5
A	5	HIS	-	expression tag	UNP A0A5M5BWR5
A	6	HIS	-	expression tag	UNP A0A5M5BWR5
A	7	HIS	-	expression tag	UNP A0A5M5BWR5
A	8	HIS	-	expression tag	UNP A0A5M5BWR5
A	9	HIS	-	expression tag	UNP A0A5M5BWR5
A	10	HIS	-	expression tag	UNP A0A5M5BWR5
A	11	SER	-	expression tag	UNP A0A5M5BWR5
A	12	SER	-	expression tag	UNP A0A5M5BWR5
A	13	GLY	-	expression tag	UNP A0A5M5BWR5
A	14	LEU	-	expression tag	UNP A0A5M5BWR5
A	15	VAL	-	expression tag	UNP A0A5M5BWR5
A	16	PRO	-	expression tag	UNP A0A5M5BWR5
A	17	ARG	-	expression tag	UNP A0A5M5BWR5
A	18	GLY	-	expression tag	UNP A0A5M5BWR5
A	19	SER	-	expression tag	UNP A0A5M5BWR5
A	20	HIS	-	expression tag	UNP A0A5M5BWR5
A	21	MET	-	expression tag	UNP A0A5M5BWR5

Continued on next page...

Continued from previous page...

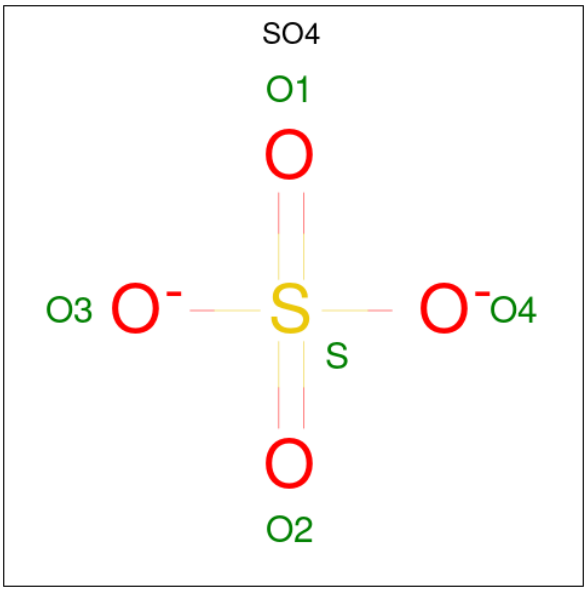
Chain	Residue	Modelled	Actual	Comment	Reference
A	22	ALA	-	expression tag	UNP A0A5M5BWR5
A	23	SER	-	expression tag	UNP A0A5M5BWR5
A	297	ASN	HIS	engineered mutation	UNP A0A5M5BWR5
B	1	MET	-	initiating methionine	UNP A0A5M5BWR5
B	2	GLY	-	expression tag	UNP A0A5M5BWR5
B	3	SER	-	expression tag	UNP A0A5M5BWR5
B	4	SER	-	expression tag	UNP A0A5M5BWR5
B	5	HIS	-	expression tag	UNP A0A5M5BWR5
B	6	HIS	-	expression tag	UNP A0A5M5BWR5
B	7	HIS	-	expression tag	UNP A0A5M5BWR5
B	8	HIS	-	expression tag	UNP A0A5M5BWR5
B	9	HIS	-	expression tag	UNP A0A5M5BWR5
B	10	HIS	-	expression tag	UNP A0A5M5BWR5
B	11	SER	-	expression tag	UNP A0A5M5BWR5
B	12	SER	-	expression tag	UNP A0A5M5BWR5
B	13	GLY	-	expression tag	UNP A0A5M5BWR5
B	14	LEU	-	expression tag	UNP A0A5M5BWR5
B	15	VAL	-	expression tag	UNP A0A5M5BWR5
B	16	PRO	-	expression tag	UNP A0A5M5BWR5
B	17	ARG	-	expression tag	UNP A0A5M5BWR5
B	18	GLY	-	expression tag	UNP A0A5M5BWR5
B	19	SER	-	expression tag	UNP A0A5M5BWR5
B	20	HIS	-	expression tag	UNP A0A5M5BWR5
B	21	MET	-	expression tag	UNP A0A5M5BWR5
B	22	ALA	-	expression tag	UNP A0A5M5BWR5
B	23	SER	-	expression tag	UNP A0A5M5BWR5
B	297	ASN	HIS	engineered mutation	UNP A0A5M5BWR5
C	1	MET	-	initiating methionine	UNP A0A5M5BWR5
C	2	GLY	-	expression tag	UNP A0A5M5BWR5
C	3	SER	-	expression tag	UNP A0A5M5BWR5
C	4	SER	-	expression tag	UNP A0A5M5BWR5
C	5	HIS	-	expression tag	UNP A0A5M5BWR5
C	6	HIS	-	expression tag	UNP A0A5M5BWR5
C	7	HIS	-	expression tag	UNP A0A5M5BWR5
C	8	HIS	-	expression tag	UNP A0A5M5BWR5
C	9	HIS	-	expression tag	UNP A0A5M5BWR5
C	10	HIS	-	expression tag	UNP A0A5M5BWR5
C	11	SER	-	expression tag	UNP A0A5M5BWR5
C	12	SER	-	expression tag	UNP A0A5M5BWR5
C	13	GLY	-	expression tag	UNP A0A5M5BWR5
C	14	LEU	-	expression tag	UNP A0A5M5BWR5
C	15	VAL	-	expression tag	UNP A0A5M5BWR5

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	16	PRO	-	expression tag	UNP A0A5M5BWR5
C	17	ARG	-	expression tag	UNP A0A5M5BWR5
C	18	GLY	-	expression tag	UNP A0A5M5BWR5
C	19	SER	-	expression tag	UNP A0A5M5BWR5
C	20	HIS	-	expression tag	UNP A0A5M5BWR5
C	21	MET	-	expression tag	UNP A0A5M5BWR5
C	22	ALA	-	expression tag	UNP A0A5M5BWR5
C	23	SER	-	expression tag	UNP A0A5M5BWR5
C	297	ASN	HIS	engineered mutation	UNP A0A5M5BWR5
D	1	MET	-	initiating methionine	UNP A0A5M5BWR5
D	2	GLY	-	expression tag	UNP A0A5M5BWR5
D	3	SER	-	expression tag	UNP A0A5M5BWR5
D	4	SER	-	expression tag	UNP A0A5M5BWR5
D	5	HIS	-	expression tag	UNP A0A5M5BWR5
D	6	HIS	-	expression tag	UNP A0A5M5BWR5
D	7	HIS	-	expression tag	UNP A0A5M5BWR5
D	8	HIS	-	expression tag	UNP A0A5M5BWR5
D	9	HIS	-	expression tag	UNP A0A5M5BWR5
D	10	HIS	-	expression tag	UNP A0A5M5BWR5
D	11	SER	-	expression tag	UNP A0A5M5BWR5
D	12	SER	-	expression tag	UNP A0A5M5BWR5
D	13	GLY	-	expression tag	UNP A0A5M5BWR5
D	14	LEU	-	expression tag	UNP A0A5M5BWR5
D	15	VAL	-	expression tag	UNP A0A5M5BWR5
D	16	PRO	-	expression tag	UNP A0A5M5BWR5
D	17	ARG	-	expression tag	UNP A0A5M5BWR5
D	18	GLY	-	expression tag	UNP A0A5M5BWR5
D	19	SER	-	expression tag	UNP A0A5M5BWR5
D	20	HIS	-	expression tag	UNP A0A5M5BWR5
D	21	MET	-	expression tag	UNP A0A5M5BWR5
D	22	ALA	-	expression tag	UNP A0A5M5BWR5
D	23	SER	-	expression tag	UNP A0A5M5BWR5
D	297	ASN	HIS	engineered mutation	UNP A0A5M5BWR5

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total O S 5 4 1	0	0
2	A	1	Total O S 5 4 1	0	0
2	B	1	Total O S 5 4 1	0	0
2	B	1	Total O S 5 4 1	0	0
2	B	1	Total O S 5 4 1	0	0
2	C	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	173	Total O 173 173	0	0
3	B	164	Total O 164 164	0	0
3	C	132	Total O 132 132	0	0

Continued on next page...

Continued from previous page...

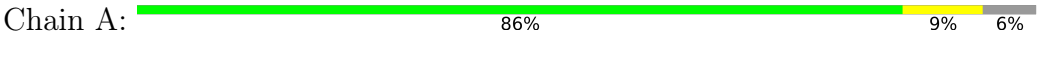
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	108	Total	O	0	1
			108	108		

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

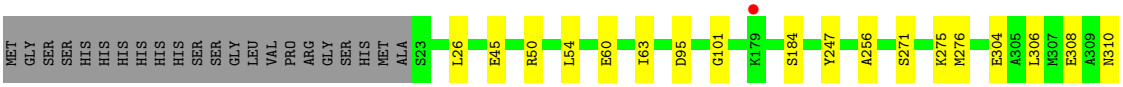
• Molecule 1: Alginate lyase family protein

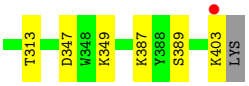
Chain A:



• Molecule 1: Alginate lyase family protein

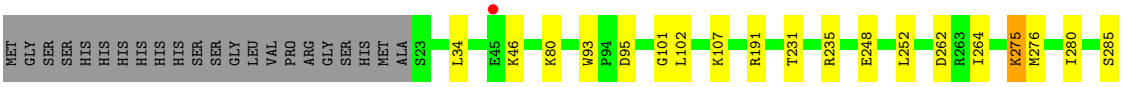
Chain B:





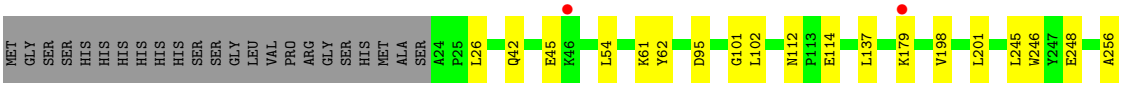
• Molecule 1: Alginate lyase family protein

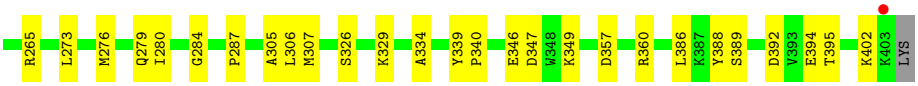
Chain C:



• Molecule 1: Alginate lyase family protein

Chain D:




R265
L273
M276
Q279
I280
G284
P287
A305
L306
M307
S326
K329
A334
Y339
P340
E346
D347
W348
K349
D357
R360
L386
K387
Y388
S389
D392
V393
E394
T395
K402
K403
LYS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	197.44Å 89.09Å 146.66Å 90.00° 120.55° 90.00°	Depositor
Resolution (Å)	48.48 – 2.36 48.48 – 2.36	Depositor EDS
% Data completeness (in resolution range)	97.4 (48.48-2.36) 97.4 (48.48-2.36)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.75 (at 2.37Å)	Xtriage
Refinement program	PHENIX 1.21_5207	Depositor
R, R_{free}	0.179 , 0.222 0.180 , 0.222	Depositor DCC
R_{free} test set	4556 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	44.9	Xtriage
Anisotropy	0.028	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 32.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	12939	wwPDB-VP
Average B, all atoms (Å^2)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.01% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.37	0/3161	0.52	0/4282
1	B	0.36	0/3168	0.53	0/4291
1	C	0.35	0/3194	0.50	0/4324
1	D	0.34	0/3147	0.51	0/4264
All	All	0.36	0/12670	0.52	0/17161

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3075	0	3062	22	1
1	B	3079	0	3064	16	0
1	C	3099	0	3101	18	0
1	D	3064	0	3041	26	1
2	A	10	0	0	1	0
2	B	15	0	0	0	0
2	C	5	0	0	0	0
2	D	15	0	0	0	0
3	A	173	0	0	4	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	164	0	0	1	0
3	C	132	0	0	3	1
3	D	108	0	0	0	1
All	All	12939	0	12268	80	2

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (80) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:215:LYS:NZ	3:A:601:HOH:O	2.18	0.76
1:A:336:ASP:OD1	1:A:377:TYR:OH	2.08	0.71
1:D:276:MET:HE3	1:D:306:LEU:HD13	1.77	0.65
1:A:180:LYS:HD3	1:A:180:LYS:H	1.66	0.61
1:D:347:ASP:O	1:D:349:LYS:HD2	2.03	0.58
1:B:347:ASP:O	1:B:349:LYS:HD3	2.04	0.58
1:A:99:ILE:HD12	3:A:735:HOH:O	2.06	0.54
1:A:375:GLN:NE2	1:A:379:ASP:OD1	2.39	0.53
1:A:54:LEU:HD21	1:A:389:SER:HA	1.90	0.52
1:B:276:MET:SD	1:B:306:LEU:HD13	2.50	0.52
1:B:45:GLU:HG2	1:C:46:LYS:HD3	1.90	0.52
1:D:54:LEU:HD21	1:D:389:SER:HA	1.91	0.52
1:D:388:TYR:HA	1:D:402:LYS:HB3	1.92	0.52
1:A:394:GLU:H	1:A:394:GLU:CD	2.19	0.51
1:A:342:TYR:O	1:A:358:GLN:NE2	2.43	0.50
1:D:61:LYS:HE2	1:D:62:TYR:CZ	2.46	0.50
1:C:252:LEU:HD22	1:C:264:ILE:HG23	1.93	0.50
1:A:260:ARG:NH1	3:A:603:HOH:O	2.45	0.50
1:B:403:LYS:NZ	3:B:614:HOH:O	2.44	0.50
1:B:95:ASP:O	1:B:101:GLY:HA2	2.12	0.50
1:A:248:GLU:HA	1:A:248:GLU:OE1	2.10	0.49
1:A:97:THR:CG2	1:B:387:LYS:HE3	2.43	0.49
1:C:276:MET:SD	1:C:306:LEU:HD13	2.52	0.49
1:C:80:LYS:NZ	3:C:611:HOH:O	2.45	0.49
1:D:246:TRP:CE2	1:D:305:ALA:HB2	2.48	0.49
1:B:54:LEU:HD21	1:B:389:SER:HA	1.95	0.48
1:D:276:MET:HG3	1:D:280:ILE:HD11	1.95	0.48
1:C:93:TRP:CD1	1:C:107:LYS:HD3	2.50	0.47
1:C:262:ASP:HB2	3:C:692:HOH:O	2.14	0.47
1:C:293:THR:HA	1:C:351:LYS:HG2	1.96	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:357:ASP:O	1:D:360:ARG:HG2	2.15	0.47
1:D:112:ASN:OD1	1:D:114:GLU:HB2	2.15	0.46
1:D:245:LEU:HD13	1:D:276:MET:HE1	1.97	0.46
1:D:95:ASP:O	1:D:101:GLY:HA2	2.17	0.45
1:B:271:SER:HG	1:B:275[A]:LYS:HZ2	1.61	0.45
1:A:89:SER:HB2	1:A:173:GLN:HB3	1.98	0.45
1:A:238:HIS:ND1	2:A:501:SO4:O2	2.37	0.45
1:C:191:ARG:HD2	3:C:630:HOH:O	2.17	0.45
1:B:304:GLU:O	1:B:308:GLU:HG3	2.17	0.45
1:D:339:TYR:N	1:D:340:PRO:HD2	2.32	0.44
1:C:248:GLU:HA	1:C:248:GLU:OE1	2.18	0.44
1:D:392:ASP:HB3	1:D:394[A]:GLU:OE2	2.18	0.44
1:D:245:LEU:CD1	1:D:276:MET:HE1	2.49	0.43
1:D:248:GLU:HA	1:D:248:GLU:OE1	2.17	0.43
1:C:285:SER:O	1:C:287:PRO:HD3	2.18	0.43
1:A:132:TYR:CD1	1:A:198:VAL:HG21	2.53	0.43
1:D:137:LEU:HA	1:D:137:LEU:HD23	1.77	0.43
1:C:46:LYS:H	1:C:46:LYS:HD2	1.84	0.43
1:A:296:LEU:HD13	1:A:348:TRP:CE3	2.53	0.43
1:A:246:TRP:CE2	1:A:305:ALA:HB2	2.54	0.42
1:C:80:LYS:HB2	1:C:80:LYS:HE2	1.68	0.42
1:C:387:LYS:HD3	1:C:387:LYS:HA	1.84	0.42
1:B:26:LEU:HG	1:B:256:ALA:HB1	2.01	0.42
1:A:45:GLU:OE2	1:A:48:VAL:HG23	2.19	0.42
1:A:194:ARG:O	1:A:198:VAL:HG23	2.19	0.42
1:B:60:GLU:HA	1:B:63:ILE:HD12	2.01	0.42
1:D:284:GLY:O	1:D:334:ALA:HA	2.19	0.42
1:B:310:ASN:HA	1:B:313:THR:HG1	1.83	0.42
1:C:95:ASP:O	1:C:101:GLY:HA2	2.20	0.42
1:C:231:THR:O	1:C:235:ARG:HG3	2.19	0.42
1:D:273:LEU:HD23	1:D:273:LEU:HA	1.81	0.42
1:D:179:LYS:HE2	1:D:179:LYS:HB3	1.79	0.42
1:D:280:ILE:O	1:D:329:LYS:HD3	2.20	0.41
1:B:387:LYS:HE2	1:B:387:LYS:HB2	1.95	0.41
1:D:346:GLU:CD	1:D:346:GLU:H	2.28	0.41
1:A:137:LEU:HA	1:A:137:LEU:HD23	1.80	0.41
1:D:307:MET:HE3	1:D:307:MET:HB3	1.94	0.41
1:C:46:LYS:HD2	1:C:46:LYS:N	2.35	0.41
1:A:121:ARG:HB3	3:A:667:HOH:O	2.20	0.41
1:D:279:GLN:O	1:D:287:PRO:HD2	2.20	0.41
1:D:386:LEU:HD13	1:D:395:THR:HB	2.01	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:95:ASP:O	1:A:101:GLY:HA2	2.20	0.41
1:B:310:ASN:HA	1:B:313:THR:OG1	2.21	0.41
1:D:198:VAL:HG13	1:D:201:LEU:HD12	2.03	0.40
1:A:387:LYS:HA	1:A:387:LYS:HD3	1.95	0.40
1:D:26:LEU:HG	1:D:256:ALA:HB1	2.03	0.40
1:B:50:ARG:HA	1:B:50:ARG:HD3	1.98	0.40
1:C:276:MET:HE2	1:C:280:ILE:HD11	2.03	0.40
1:B:247:TYR:CD1	1:B:247:TYR:C	3.00	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:718:HOH:O	3:D:699:HOH:O[4_456]	2.07	0.13
1:A:327:ASN:O	1:D:265:ARG:NH1[2_556]	2.15	0.05

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	382/404 (95%)	373 (98%)	9 (2%)	0	100	100
1	B	383/404 (95%)	375 (98%)	8 (2%)	0	100	100
1	C	386/404 (96%)	379 (98%)	7 (2%)	0	100	100
1	D	380/404 (94%)	372 (98%)	8 (2%)	0	100	100
All	All	1531/1616 (95%)	1499 (98%)	32 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	328/344 (95%)	325 (99%)	3 (1%)	75 85
1	B	329/344 (96%)	328 (100%)	1 (0%)	91 95
1	C	332/344 (96%)	328 (99%)	4 (1%)	67 80
1	D	326/344 (95%)	322 (99%)	4 (1%)	67 80
All	All	1315/1376 (96%)	1303 (99%)	12 (1%)	79 85

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	155	ARG
1	A	200[A]	LYS
1	A	200[B]	LYS
1	B	184	SER
1	C	34	LEU
1	C	102	LEU
1	C	275[A]	LYS
1	C	275[B]	LYS
1	D	42	GLN
1	D	45	GLU
1	D	102	LEU
1	D	326	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	ASN
1	C	125	ASN
1	C	242	ASN
1	D	42	GLN
1	D	288	GLN
1	D	375	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

9 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	SO4	A	502	-	4,4,4	0.53	0	6,6,6	0.39	0
2	SO4	D	503	-	4,4,4	0.54	0	6,6,6	0.27	0
2	SO4	D	501	-	4,4,4	0.59	0	6,6,6	0.08	0
2	SO4	A	501	-	4,4,4	0.63	0	6,6,6	0.26	0
2	SO4	B	503	-	4,4,4	0.61	0	6,6,6	0.32	0
2	SO4	D	502	-	4,4,4	0.58	0	6,6,6	0.09	0
2	SO4	C	501	-	4,4,4	0.53	0	6,6,6	0.30	0
2	SO4	B	501	-	4,4,4	0.62	0	6,6,6	0.15	0
2	SO4	B	502	-	4,4,4	0.59	0	6,6,6	0.20	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	SO4	1	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	381/404 (94%)	-0.45	1 (0%)	90	91	25, 45, 64, 88	3 (0%)
1	B	381/404 (94%)	-0.43	2 (0%)	87	89	27, 45, 64, 83	4 (1%)
1	C	381/404 (94%)	-0.35	1 (0%)	90	91	24, 47, 68, 92	7 (1%)
1	D	380/404 (94%)	-0.19	3 (0%)	82	85	27, 51, 75, 93	2 (0%)
All	All	1523/1616 (94%)	-0.36	7 (0%)	87	89	24, 47, 70, 93	16 (1%)

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	403	LYS	2.8
1	D	46	LYS	2.3
1	C	45	GLU	2.2
1	B	179	LYS	2.2
1	B	403	LYS	2.1
1	D	179	LYS	2.1
1	A	180	LYS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no oligosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	SO4	D	501	5/5	0.42	0.20	76,76,90,98	5
2	SO4	B	502	5/5	0.70	0.15	75,101,109,123	5
2	SO4	B	501	5/5	0.72	0.15	110,110,137,144	0
2	SO4	D	502	5/5	0.82	0.14	59,65,72,77	5
2	SO4	A	501	5/5	0.84	0.13	88,100,131,136	0
2	SO4	A	502	5/5	0.96	0.12	41,50,59,65	0
2	SO4	B	503	5/5	0.96	0.10	46,55,58,71	0
2	SO4	D	503	5/5	0.96	0.09	57,58,73,74	0
2	SO4	C	501	5/5	0.97	0.08	52,55,66,68	0

6.5 Other polymers (i)

There are no such residues in this entry.